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Paper Title: On the crack bifurcation and fanning of crack growth data

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Abstract: Crack growth data obtained from ASTM load shedding method for different R values show some fanning especially for aluminum alloys. It is believed by the authors and it has been shown before that the observed fanning is due to the crack bifurcation occurs in the near threshold region which is a function of intrinsic properties of the alloy. Therefore, validity of the ASTM load shedding test procedure and results is confirmed. However, this position has been argued by some experimentalists who believe the fanning is an artifact of the test procedure and thus the obtained results are invalid. It has been shown that using a special test procedure such as using compressively pre-cracked specimens will eliminate the fanning effect. Since not using the fanned data fit can result in a significantly lower calculated cyclic life, design of a component, particularly for rotorcraft and propeller systems will considerably be impacted and therefore this study is of paramount importance. In this effort both test procedures i.e. ASTM load shedding and the proposed compressive pre-cracking have been used to study the fatigue crack growth behavior of compact tension specimens made of aluminum alloy 2524-T3. Fatigue crack growth paths have been closely observed using SEM machines to investigate the effects of compression pre-cracking on the crack bifurcation behavior. The results of this study will shed a light on resolving the existing argument by better understanding of near threshold fatigue crack growth behavior.